

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: 2826

Examiner: Ahmed N. Sefer

Serial No. 10/796,763

Filed: March 8, 2004

In re Application of: Hynecek et al.

For: METHOD AND APPARATUS FOR IMPROVING SENSITIVITY IN  
VERTICAL COLOR CMOS IMAGE SENSORS

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BRIEF ON APPEAL

Director of Patents  
Box AF  
Washington D. C. 20231

Sirs:

This is a Brief on Appeal for consideration by the Board of Patent Appeals and Interferences ("Board") of the Final Office Action, mailed April 24, 2006, rejecting claim 1 in above-identified application. A timely Notice of Appeal was filed on July 24, 2006, and received by the United States Patent and Trademark Office on July 27, 2006.

REAL PARTY IN INTEREST

The only real party in interest regarding the present application is Foveon, Inc., assignee of the present application.

RELATED APPEALS AND INTERFERENCES

To the best of Appellants' knowledge, there are no appeals or interferences that will directly affect or be directly affected by or have a bearing upon the Board's decision in the pending appeal.

### STATUS OF CLAIMS

There are a total of three claims in the application. Claim 1 has been rejected pursuant to 35 U.S.C. 102(b). Claims 2 and 3 have been objected to as depending from a rejected claim. Claim 1 is on appeal.

### STATUS OF AMENDMENTS

There are no pending amendments that were filed after the Final Office Action.

### SUMMARY OF CLAIMED SUBJECT MATTER

Directing attention to FIG. 2, and the specification at paragraphs 0020-0024, the present invention is a light-sensing pixel (200) having a p type doped region (202) disposed in a CMOS image sensor. The sensor comprises a first doped charge collecting region (203) buried within the p type doped region and configured to operate as a depleted potential well. A first n+ type doped plug (208) extends from near the surface of the image sensor to the first charge collecting region. A second doped charge collecting region (204) is buried within the p type doped region, is vertically separated from the first charge collecting region by the p type doped region, and is configured to operate as a depleted potential well. A second n+ type doped plug (207) extends from near the surface of the image sensor to the second charge collecting region.

### GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Appellants respectfully take the position that Appellants' invention has not been anticipated pursuant to 35 U.S.C. §102(b) by the prior art of record. Two separate rejections are at issue in the present appeal.

The first rejection is made pursuant to 35 U.S.C. §102(b). Claim 1 has been rejected under 35 U.S.C. 102(b) as being anticipated by Merrill (U.S. Patent No. 6,930,336) (hereinafter “Merrill ‘336”).

The second rejection is made pursuant to 35 U.S.C. §102(b). Claim 1 has been rejected under 35 U.S.C. 102(b) as being anticipated by the admitted prior art shown in FIG. 1 of the above-identified patent application (hereinafter “the APA”).

ARGUMENT FOR FIRST REJECTION MADE PURSUANT TO 35 U.S.C. §102(b).

Appellant considers that claim 1 presented for consideration before the Board is allowable over the prior art of record. Because claims 2 and 3 stand objected to as depending from a rejected claim, allowance of claim 1 will result in allowance of claims 2 and 3.

1. The Anticipation Rejections

In the Final Office Action, dated April 24, 2006, Claim 1 has been rejected pursuant to 35 U.S.C. § 102(b), as being anticipated by Merrill ‘336. Appellant respectfully disagrees with the Examiner’s contentions regarding this rejection.

To anticipate a claim under 35 U.S.C. § 102, a single source must contain all of the elements of the claim. *Lewmar Marine Inc. v. Barient, Inc.*, 827 F.2d 744, 747, 3 U.S.P.Q.2d 1766, 1768 (Fed. Cir. 1987), *cert. denied*, 484 U.S. 1007 (1988). Moreover, the single source must disclose all of the claimed elements “arranged as in the claim.” *Structural Rubber Prods. Co. v. Park Rubber Co.*, 749 F.2d 707, 716, 223 U.S.P.Q. 1264, 1271 (Fed. Cir. 1984).

Merrill `336 does not teach or suggest as claimed in Claim 1, “a first doped charge collecting region buried within the p-type doped region and configured to operate as a depleted potential well,” as asserted by the Examiner. It is respectfully submitted that the Examiner mischaracterizes the Merrill `336 prior art reference by attributing to it disclosure which it does not contain.

ARGUMENT FOR SECOND REJECTION MADE PURSUANT TO 35 U.S.C. § 102(b).

In the Final Office Action, dated April 24, 2006, Claim 1 has also been rejected pursuant to 35 U.S.C. § 102(b) as being anticipated by the APA of FIG. 1 of the above-identified patent application. Appellant respectfully disagrees with the Examiner’s contentions regarding this rejection.

As stated above, to anticipate a claim under 35 U.S.C. § 102, a single source must contain all of the elements of the claim. *Lewmar Marine Inc. v. Barent, Inc.*, 827 F.2d 744, 747, 3 U.S.P.Q.2d 1766, 1768 (Fed. Cir. 1987), *cert. denied*, 484 U.S. 1007 (1988). Moreover, the single source must disclose all of the claimed elements “arranged as in the claim.” *Structural Rubber Prods. Co. v. Park Rubber Co.*, 749 F.2d 707, 716, 223 U.S.P.Q. 1264, 1271 (Fed. Cir. 1984).

The APA does not teach as claimed in Claim 1, “a first doped charge collecting region buried within the p-type doped region and configured to operate as a depleted potential well,” as asserted by the Examiner. It is respectfully submitted that the Examiner mischaracterizes the APA prior art by attributing to it disclosure which it does not contain.

In the Office Action mailed on April 24, 2006, the Examiner asserts that applicants' response filed on February 2, 2006 is faulty in that it fails to comply with the provisions of 37 C.F.R. §1.111(b). It is in this context of refuting this assertion by the Examiner that the insufficiency of the cited prior-art references will be presented.

It is respectfully submitted that the Examiner is misinterpreting the provisions of 37 C.F.R. §1.111(b). According to §1.111(b), “[t]he reply must present arguments pointing out the specific distinctions believed to render the claims, including any newly-presented claims, patentable over any applied references.”

It is respectfully submitted that such arguments have been properly made. Applicant is properly entitled to point out that any prior-art reference does not disclose what the Examiner says it discloses. That is what has been done during prosecution of the above-identified patent application. Because it is axiomatic that the directive set forth in §1.111(b) of the rules must allow applicants for patent to point out instances where the Examiner has misread or misinterpreted the prior art in applying that prior art to the pending claims, it therefore follows that if the Examiner has applied a prior-art reference to a claim by misreading or misinterpreting the reference, a reply by an applicant that points out the specific misreading or misinterpretation of the reference certainly addresses “the specific distinctions believed to render the claims, including any newly-presented claims, patentable over any applied references” and is entirely proper under 37 C.F.R. §1.111(b).

In the present case, it is applicants' position the Examiner has materially misread and misinterpreted the two prior-art references relied upon in formulating the rejection by

erroneously attributing to them disclosure of characteristics and properties of the structure recited in rejected claim 1. Specifically, at both pages 3 and 4 of the Office Action mailed on April 24, 2006, the Examiner states that Merrill `336 and the APA (FIG. 1 of the above-identified patent application) “disclose a first doped charge collecting region within a p-type doped region and configured to operate as a depleted potential well.”

In response to this mischaracterization of the prior art by the Examiner, Richard B. Merrill, an inventor of the subject matter claimed in the above-identified patent application, and the inventor of the subject matter of the two references cited against the rejected claims, submitted a declaration that is of record in the above-identified patent application and is thus of record in this appeal. It is respectfully submitted that the Merrill declaration and supporting arguments made by counsel in response to the outstanding rejection in the Response mailed on January 30 2006 are in full compliance with the provisions of 37 C.F.R. §1.111(b). It is further submitted that the Merrill declaration and supporting arguments made by counsel are fully dispositive of the issues on appeal with respect to both of the outstanding §102(b) rejections.

The Merrill declaration squarely refutes the mischaracterizations made by the Examiner of both of the prior art references used to reject claim 1. Specifically, with respect to Merrill `336, the Merrill declaration states:

“The Examiner asserts that United States Patent No. 6,930,336 discloses a CMOS image sensor comprising (among other things) “a first doped charge collecting region 46 buried within the p-type doped region and configured to operate as a depleted potential well.” The Examiner’s assertion is incorrect. The charge collecting region 46 buried within the p-

type doped region in the CMOS image sensor disclosed in United States Patent No. 6,930,336 is not configured to operate as a depleted potential well as required by claim 1 of the above-identified patent application. Collecting region 46 in United States Patent No. 6,930,336 does not operate as a depleted potential well. In order for collecting region 46 to operate as a depleted potential well, the disclosure of the reference would have to be modified. The voltage on collecting region 46 would have to be increased from what is disclosed to a value that would cause the image sensor to operate in a substantially degraded fashion with unacceptable leakage. Because of this problem that would result from such operation, it is my opinion that no person of ordinary skill in the art would be motivated to modify the disclosure of United States Patent No. 6,930,336 to operate this device in that fashion.”

Merrill Declaration, Paragraph 5.

Similarly, with respect to the APA, the Merrill declaration states:

“The Examiner also asserts that the admitted prior art disclosed with reference to FIG. 1 of the above-identified patent application discloses a CMOS image sensor comprising (among other things) “a first doped charge collecting region 103 buried within the p-type doped region and configured to operate as a depleted potential well.” The Examiner’s assertion is incorrect. The charge collecting region 103 buried within the p-type doped region 102 in the CMOS image sensor as disclosed in FIG. 1 of the above-identified patent application is not configured to operate as a depleted potential well as required by claim 1 of the above-identified patent application. FIG. 1 of the above-identified patent application discloses the structure of prior imaging sensors that were manufactured by Foveon, the assignee of the present invention. The image sensor depicted in FIG. 1 of the above-identified patent application does not operate in that manner wherein collecting region 103 operates as a depleted potential well.”

In response to the Merrill declaration, in the Office Action mailed on April 24, 2006, the Examiner states:

“In response, it is pointed out that Merrill clearly discloses a first doped charge collecting region 46 buried within the p-type doped region. Regarding the recitation which calls “**to operate ...**”, it constitutes

functional language which must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. *If the prior art structure is capable of performing the intended use, then it meets the claim.* [italics added] [citations omitted]. As for modifying Merrill's device in a manner that would seriously degrade its operation, the arguments fail to comply with 37 C.F.R. §1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the reference."

It is respectfully submitted that the italicized portion of the Examiner's quoted response is dispositive here. Applicants completely agree with the Examiner's quoted characterization of the law: "If the prior art structure is capable of performing the intended use, then it meets the claim." Conversely, the law is that if the prior art structure is *not* capable of performing the intended use, then it *does not* meet the claim. Again, as stated in paragraph 5 of the Merrill Declaration with respect to Merrill '336:

"The charge collecting region 46 buried within the p-type doped region in the CMOS image sensor disclosed in United States Patent No. 6,930,336 is not configured to operate as a depleted potential well as required by claim 1 of the above-identified patent application. Collecting region 46 in United States Patent No. 6,930,336 does not operate as a depleted potential well. In order for collecting region 46 to operate as a depleted potential well, the disclosure of the reference would have to be modified."

Similarly, with respect to the APA, the Merrill declaration states at paragraph 6:

"The charge collecting region 103 buried within the p-type doped region 102 in the CMOS image sensor as disclosed in FIG. 1 of the above-identified patent application is not configured to operate as a depleted potential well as required by claim 1 of the above-identified patent application."

There is no evidence in the record that the Examiner disputes any of the statements made in the Merrill declaration concerning the deficiencies of these two prior-art

references. It is respectfully submitted that the Merrill declaration establishes that Merrill is a person of ordinary skill in the art. In addition, Merrill is the named inventor of the prior art references asserted against the claims. There is no dispute that Merrill understands the operation of the prior art CMOS imagers relied upon by the Examiner to formulate the rejections of claim 1.

The Examiner does not dispute any statement made in the Merrill declaration. The Examiner has made no attempt to introduce any evidence or argument that would refute any statement made in the Merrill declaration. It is submitted that no such evidence exists. MPEP §707.07(f) requires that the Examiner answer all material traversed. Failure to refute the substance of the Merrill declaration should result in the substance of the Merrill declaration being taken at face value. *See In re Hermann*, 261 F.2d 598, 120 USPQ 182 (CCPA 1958). *See also In re Soni*, 54 F.3d 746, 751, 34 USPQ2d 1684, 1688 (CAFC 1995).

It is respectfully submitted that the above-quoted portions of the Merrill declaration establish that the structures disclosed in the prior-art relied upon by the Examiner for the rejections are not capable of functioning in the manner asserted by the Examiner in support of the rejections of claim 1 that are presently on appeal. The failure of each prior-art reference to disclose structure that meets the limitations of claim 1 on appeal will be dealt with individually.

The Examiner's assertion of non-compliance with 37 C.F.R. §1.111(b) made on page 2 of the Office Action mailed on April 24, 2006 appears to be directed solely to the statement in paragraph 5 of the Merrill declaration that no one skilled in the art would

be motivated to modify the structure of the Merrill '336 reference, since this is the only mention made by the Examiner relating to this alleged defect in the Merrill declaration. It is respectfully submitted that any reliance by the Examiner on the proposition that this statement renders the Merrill declaration noncompliant with 37 C.F.R. §1.111(b) is misplaced, the disputed statement being irrelevant to any issue relevant to this appeal.

It must be kept in mind that the outstanding rejections presently on appeal were made pursuant to the provisions of 35 U.S.C §102(b). The fact that the Merrill declaration states that no one would be motivated to *modify* the Merrill '336 reference simply proves that, as *disclosed*, the structure disclosed in the Merrill '336 reference is not capable of being operated in the manner asserted by the Examiner to support the rejection. Because the rejection is made pursuant to §102, that is the end of the inquiry. The Examiner says nothing that could be construed to dispute the Merrill declaration on this point.

The statement in the Merrill declaration concerning the lack of motivation to modify the Merrill '1336 reference plainly does not relate at all to the present rejections made pursuant to §102, but was included in the Merrill declaration to dissuade the Examiner from making a potential obviousness rejection pursuant to §103 in reliance on the Merrill '336 reference. The Board needs no explanation from counsel concerning the applicability of the concept of modifying a reference in the context of §103. No such obviousness rejection was ever made and no such rejection is before the Board in this appeal. The issue of modification is therefore irrelevant to the issues on appeal except to the extent that it certainly serves as evidence of the fact that the structure disclosed in

the Merrill `336 reference is not capable of operating in the manner recited in claim 1 without being modified. Section 102 is therefore not pertinent.

With respect to the APA, Merrill states at paragraph 6 of his declaration that:

“The charge collecting region 103 buried within the p-type doped region 102 in the CMOS image sensor as disclosed in FIG. 1 of the above-identified patent application *is not configured to operate as a depleted potential well* as required by claim 1 of the above-identified patent application.” [emphasis added]

Because the charge collecting region 103 disclosed in the APA is not *configured to* operate as a depleted potential well, it *cannot operate* as a depleted potential well as required by claim 1 on appeal. This is a matter of common English-language usage. Again, the rejection at issue based on the APA was made pursuant to §102(b), so any theoretical question concerning whether it *might* be possible to *reconfigure* (*i.e.*, *modify*) the charge collecting region 103 of the APA in order to so operate the imager shown in the figure is irrelevant to any issue in this appeal. Finally, it is noted that there is no admission or other evidence in the record that such a modification, if made, would result in an operative device. Again, the Examiner does not dispute the Merrill declaration on this dispositive point.

In sum, given the Examiner’s own (correct) characterization of the law, *viz.*: “If the prior art structure is capable of performing the intended use, then it meets the claim,” as well as its necessary converse, (*i.e.*, if the prior art structure is *not* capable of performing the intended use, then it *does not* meet the claim), it is plain that the §102(b) rejections at issue based on Merrill `336 and the APA are untenable and cannot stand. The Merrill

declaration establishes (paragraph 5) that the device disclosed in Merrill '336 is not capable of performing the intended use recited in rejected claim 1, and the Merrill declaration establishes (paragraph 6) that the device disclosed as the APA is not capable of performing the intended use recited in rejected claim 1.

#### Dependent Claims

As noted above, dependent Claims 2 and 3 have been objected to as depending from a rejected claim. If claim 1 is allowable, dependent claims 2 and 3 are allowable.

#### CONCLUSION

It is respectfully urged that the Examiner has erred in the separate rejections of claim 1 pursuant to 35 U.S.C. 102(b) based on Merrill '336 and the APA. The cited references do not teach each and every element of claim 1 of the present application. Therefore, the Examiner has failed to make a sustainable §102(b) rejection.

Accordingly, in view of the foregoing comments and arguments, it is respectfully requested that the Board reverse the Examiner's rejection and allows claim 1 presently pending in this application.

Respectfully submitted,  
SIERRA PATENT GROUP, LTD.

Dated: August 30, 2007

/john w. crosby/

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CLAIMS APPENDIX

1. A light-sensing pixel, having a p type doped region, in a CMOS image sensor, comprising:

a first doped charge collecting region buried within the p type doped region and configured to operate as a depleted potential well;

a first n+ type doped plug extending from near the surface of the image sensor to the first charge collecting region;

a second doped charge collecting region buried within the p type doped region, the second charge collecting region vertically separated from the first charge collecting region by the p type doped region and configured to operate as a depleted potential well; and

a second n+ type doped plug extending from near the surface of the image sensor to the second charge collecting region.

2. The pixel of claim 1, the first and second charge collecting regions further comprising:

a first extension with n+ type doping coupled to and between the first charge collecting region and the first plug, and having a different doping concentration than the first charge collecting region; and

a second extension with n+ type doping coupled to and between the second charge collecting region and the second plug, and having a different doping concentration than the second charge collecting region.

3. The pixel of claim 2 wherein the first and second extensions are configured to operate not fully depleted of mobile charge.

RELATED PROCEEDINGS APPENDIX

**NOT APPLICABLE**

**EVIDENCE**

The below statement was entered by the Examiner on April 24, 2006.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: 2826

Examiner: Ahmen D. Scfer

Serial No. 10/796,763

Filed: March 8, 2004

In re Application of: Hynecek et al.

For: METHOD AND APPARATUS FOR IMPROVING SENSITIVITY IN  
VERTICAL COLOR CMOS IMAGE SENSORS

Certificate of Mailing

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail, in an envelope addressed to Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on January 30, 2006.  
Signed Richard B. Merrill  
Name

DECLARATION OF RICHARD B. MERRILL

I, Richard B. Merrill, declare and state as follows:

1. I am employed by Foveon, Inc., the assignee of the above-identified patent application. I obtained my BSEE from Dartmouth College in 1978. I was employed by IBM as an engineer from 1978 until 1981. I was employed by National Semiconductor Corporation as a staff engineer from 1981 through 1996, when I joined the staff at Foveon. I have been involved in the design of integrated circuits and the semiconductor devices they contain since 1978. As a result of my education and experience, I consider myself to be a person of ordinary skill in the art of integrated circuit and device design.

2. I am the inventor of the subject matter disclosed and claimed in the above-identified patent application. I am familiar with and understand the contents of the above-identified patent application.

3. I am also the inventor of the subject matter disclosed and claimed in United States Patent No. 6,930,336. I am familiar with and understand the content of United States Patent No. 6,930,336.

4. I have read and understood the Office Action in the above-identified patent application that was mailed on September 30, 2005.

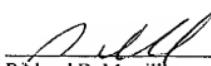
5. The Examiner asserts that United States Patent No. 6,930,336 discloses a CMOS image sensor comprising (among other things) "a first doped charge collecting region 46 buried within the p-type doped region and configured to operate as a depleted potential well." The Examiner's assertion is incorrect. The charge collecting region 46 buried within the p-type doped region in the CMOS image sensor disclosed in United States Patent No. 6,930,336 is not configured to operate as a depleted potential well as required by claim 1 of the above-identified patent application. Collecting region 46 in United States Patent No. 6,930,336 does not operate as a depleted potential well. In order for collecting region 46 to operate as a depleted potential well, the disclosure of the reference would have to

be modified. The voltage on collecting region 46 would have to be increased from what is disclosed to a value that would cause the image sensor to operate in a substantially degraded fashion with unacceptable leakage. Because of this problem that would result from such operation, it is my opinion that no person of ordinary skill in the art would be motivated to modify the disclosure of United States Patent No. 6,930,336 to operate this device in that fashion.

6. The Examiner also asserts that the admitted prior art disclosed with reference to FIG. 1 of the above-identified patent application discloses a CMOS image sensor comprising (among other things) "a first doped charge collecting region 103 buried within the p-type doped region and configured to operate as a depleted potential well." The Examiner's assertion is incorrect. The charge collecting region 103 buried within the p-type doped region 102 in the CMOS image sensor as disclosed in FIG. 1 of the above-identified patent application is not configured to operate as a depleted potential well as required by claim 1 of the above-identified patent application. FIG. 1 of the above-identified patent application discloses the structure of prior imaging sensors that were manufactured by Foveon, the assignee of the present invention. The image sensor depicted in FIG. 1 of the above-identified patent application does not operate in that manner wherein collecting region 103 operates as a depleted potential well.

PATENT  
Docket No.: FOV-155

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

  
\_\_\_\_\_  
Richard B. Merrill

1-27-06  
\_\_\_\_\_  
Date